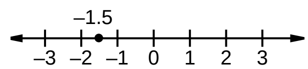
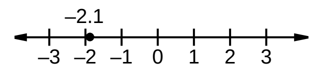
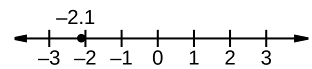
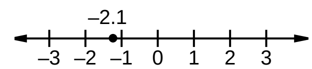
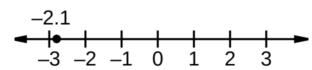
Introductory Algebra
Chapter 1 Review

Objective [1.1a] Evaluate algebraic expressions by substitution.		
Brief Procedure	Example	Practice Exercise
Substitute for the variable(s) and carry out the resulting calculation.	Evaluate $m-n$ for $m=29$ and $n=12$. Substitute 29 for m and 12 for n and carry out the subtraction. $m-n=29-12=17$	1. Evaluate $\frac{x}{y}$ for $x=72$ and $y=9$. A. $\frac{1}{8}$ B. 8 C. 63 D. 81
Objective [1.1b] Translate phrases to algebraic expressions.		
Brief Procedure	Example	Practice Exercise
Learn which words translate to certain operation symbols. (See page 45 in the text.) Choose a variable or variables to correspond to the number or numbers involved. It can be helpful to try some numerical examples before writing the algebraic expression.	Translate to an algebraic expression: Four less than some number. Let n = the number. Now if the number were 7, then the translation would be $7-4$. Similarly, if the number were 52, then the translation would be $52-4$. Thus, we see from these numerical examples, that if the number were n, the translation would be $n-4$.	2. Translate to an algebraic expression: Three times some number. A. $n+3$ B. $n-3$ C. $3-n$ D. $3n$
Objective [1.2a] Name the integer that corresponds to a real-world situation.		
Brief Procedure	Example	Practice Exercise
Determine whether a negative integer or a positive integer corresponds to the given situation.	Tell which integers correspond to this situation: A student has \$106 in his checking account. The student owes \$248 on his credit card. The integer 106 corresponds to having \$106 in a checking account. The integer -248 corresponds to a \$248 credit card debt.	3. Tell which integer corresponds to this situation: A business lost \$1200 during a 30-day period. A. $-36,000$ B. -1200 C. 1200 D. 36,000

Objective [1.2b] Graph rational numbers on a number line.		
Brief Procedure	Example	Practice Exercise
Find and mark the point on the number line that corresponds to the given number.	Graph -1.5. The graph of -1.5 is halfway between -2 and -1. 	4. Graph -2.1. A.  B.  C.  D. 

Objective [1.2c] Convert from fractional notation to decimal notation for a rational number.		
Brief Procedure	Example	Practice Exercise
Disregard the sign of the number and carry out the division indicated by the resulting fraction. Then express the result as a positive or negative number, depending on the sign of the original fraction.	Find decimal notation for $-\frac{7}{4}$. We first find decimal notation for $\frac{7}{4}$. Since $\frac{7}{4}$ means $7 \div 4$, we divide. $$\begin{array}{r} 1.75 \\ 4\,\overline{)\,7.00} \\ \underline{4} \\ 3\,0 \\ \underline{2\,8} \\ 2\,0 \\ \underline{2\,0} \\ 0 \end{array}$$ Thus, $\frac{7}{4} = 1.75$, so $-\frac{7}{4} = -1.75$.	5. Find decimal notation for $-\frac{1}{8}$. A. -0.125 B. -0.18 C. -0.25 D. -0.81

Objective [1.2d] Determine which of two real numbers is greater and indicate which, using $<$ or $>$; given an inequality like $a < b$, write another inequality with the same meaning. Determine whether an inequality like $-3 \leq 5$ is true or false.		
Brief Procedure	Example	Practice Exercises
To determine which of two real numbers is greater, consider the relative position of the two numbers on the number line. The one to the left is less than the one to the right. The symbol $<$ means "is less than" and the symbol $>$ means "is greater than."	Use $<$ or $>$ for $\square$ to write a true sentence: $-7 \ \square \ -10$ Since -7 is to the right of -10 on the number line, we have $-7 > -10$.	6. Use $<$ or $>$ for $\square$ to write a true sentence: $-8 \ \square \ 1$ A. $<$ B. $>$

Objective [1.2d] (continued)

Brief Procedure	Example	Practice Exercises
Given an inequality like $a < b$, write another inequality with the same meaning by interchanging a and b and reversing the direction of the inequality symbol.	Write another inequality with the same meaning as $x > 8$. The inequality $8 < x$ has the same meaning.	7. Write another inequality with the same meaning as $-3 < t$. A. $t < -3$ B. $t > 3$ C. $3 < t$ D. $t > -3$
An inequality like $-3 \leq 5$ is true if either $-3 < 5$ is true or $-3 = 5$ is true. If not, then the inequality is false.	Determine whether each inequality is true or false. a) $-4 \leq 1$ b) $6 \geq 6$ c) $-10 \geq 2$ a) $-4 \leq 1$ is true since $-4 < 1$ is true. b) $6 \geq 6$ is true since $6 = 6$ is true. c) $-10 \geq 2$ is false since neither $-10 > 2$ nor $-10 = 2$ is true.	8. Determine whether the inequality $-1 \geq -8$ is true or false. A. True B. False

Objective [1.2e] Find the absolute value of a real number.

Brief Procedure	Example	Practice Exercise
If the number is negative, make it positive. If the number is positive or zero, leave it alone.	Find $\vert -4.3\vert$. The number is negative, so we make it positive. $\vert -4.3\vert = 4.3$	9. Find $\vert 59\vert$. A. -59 B. 0 C. 59

Objective [1.3a] Add real numbers without using a number line.

Brief Procedure	Example	Practice Exercise
1. *Positive numbers*: Add the same as arithmetic numbers. The answer is positive. 2. *Negative numbers*: Add absolute values. The answer is negative. 3. *A positive and a negative number*: Subtract the smaller absolute value from the larger. Then: a) If the positive number has the greater absolute value, the answer is positive. b) If the negative number has the greater absolute value, the answer is negative. c) If the numbers have the same absolute value, the answer is 0. 4. *One number is zero*: The sum is the other number.	Add without using a number line: $-15 + 9$. We have a negative and a positive number. The absolute values are 15 and 9. The difference is 6. The negative number has the larger absolute value, so the answer is negative. $-15 + 9 = -6$	10. Add without using a number line: $-1.2 + (-3.4)$. A. 4.6 B. 2.2 C. -2.2 D. -4.6

Objective [1.3b] Find the opposite, or additive inverse, of a real number.

Brief Procedure	Example	Practice Exercise
The opposite, or additive inverse, of any real number a is the number $-a$ such that $a + (-a) = (-a) + a = 0$. To find the opposite of a number, we change its sign.	Find the opposite of $\frac{5}{3}$. The opposite of $\frac{5}{3}$ is $-\frac{5}{3}$ because $\frac{5}{3} + \left(-\frac{5}{3}\right) = 0$.	11. Find the opposite of -20. A. -20 B. 0 C. 20

Objective [1.4a] Subtract real numbers and simplify combinations of additions and subtractions.

Brief Procedure	Example	Practice Exercises
For any real numbers a and b, $a - b = a + (-b)$. (To subtract, add the opposite, or additive inverse, of the number being subtracted.)	Subtract: $6 - (-7)$. The opposite of -7 is 7. We change the subtraction to addition and add the opposite. $6 - (-7) = 6 + 7 = 13$	12. Subtract: $2 - 12$. A. -14 B. -10 C. 10 D. 14
When several additions and subtractions occur together, rewrite the subtractions as additions and then carry out the calculation.	Simplify: $5 - (-1) - 3 + 7$. $5 - (-1) - 3 + 7 = 5 + 1 + (-3) + 7$ $= 10$	13. Simplify: $-8 - 4 + 12 - (-9)$. A. -33 B. -15 C. 9 D. 25

Objective [1.4b] Solve applied problems involving addition and subtraction of real numbers.

Brief Procedure	Example	Practice Exercise
Determine whether addition or subtraction applies to the given situation. Then carry out the appropriate calculation.	The temperature in a small town was 46° at 7 A.M. and it rose 18° by noon. What was the temperature at noon? We add 18° to 46°: 46° + 18° =64° The temperature was 64° at noon.	14. Corey has \$278 in his checking account. He writes a check for \$54 to pay for a textbook. What is the balance in his checking account? A. \$54 B. \$176 C. \$224 D. \$332

Objective [1.5a] Multiply real numbers.

Brief Procedure	Example	Practice Exercise
a) Multiply the absolute values. b) If the signs are the same, the answer is positive. c) If the signs are different, the answer is negative.	Multiply: $-2.4(3)$. The signs are different, so the answer is negative. $-2.4(3) = -7.2$	15. Multiply: $-7(-9)$. A. -63 B. -16 C. 2 D. 63

Objective [1.6a] Divide integers.		
Brief Procedure	Example	Practice Exercise
a) Divide the absolute values. b) If the signs are the same, the answer is positive. c) If the signs are different, the answer is negative.	Multiply: $-36 \div (-4)$. The signs are the same, so the answer is positive. $-36 \div (-4) = 9$	16. Divide: $\frac{56}{-8}$. A. -9 B. -7 C. 7 D. 9

Objective [1.6b] Find the reciprocal of a real number.		
Brief Procedure	Example	Practice Exercise
Two numbers whose product is 1 are called reciprocals of each other. For $a \neq 0$, the reciprocal of a can be named $\frac{1}{a}$ and the reciprocal of $\frac{1}{a}$ is a. The reciprocal of a nonzero number $\frac{a}{b}$ can be named $\frac{b}{a}$. The number 0 has no reciprocal.	Find the reciprocal of $-\frac{4}{5}$. The reciprocal of $-\frac{4}{5}$ is $-\frac{5}{4}$, because $-\frac{4}{5}\left(-\frac{5}{4}\right) = 1$.	17. Find the reciprocal of 2. A. -2 B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. 2

Objective [1.6c] Divide real numbers.		
Brief Procedure	Example	Practice Exercise
For any real numbers a and b, $b \neq 0$, $a \div b = \frac{a}{b} = a \cdot \frac{1}{b}$. (To divide, we can multiply by the reciprocal of the divisor.)	Divide: $-\frac{1}{3} \div \frac{2}{7}$. $-\frac{1}{3} \div \frac{2}{7} = -\frac{1}{3} \cdot \frac{7}{2} = -\frac{7}{6}$	18. Divide: $-\frac{3}{4} \div \left(-\frac{5}{11}\right)$. A. $-\frac{53}{44}$ B. $-\frac{13}{44}$ C. $\frac{15}{44}$ D. $\frac{33}{20}$

Objective [1.7a] Find equivalent fractional expressions and simplify fractional expressions.

Brief Procedure	Example	Practice Exercises
Given a fractional expression, write an equivalent fractional expression with a specified denominator by first determining the factors of the new denominator that are missing from the original denominator. Then multiply by 1, using the missing factors to determine the form of 1 used.	Write a fractional expression equivalent to $\frac{2}{5}$ with a denominator of $5y$. Note that $5y = 5 \cdot y$. The denominator, 5, is missing a factor of y. Thus we multiply by 1 using y/y. $\frac{2}{5} = \frac{2}{5} \cdot 1 = \frac{2}{5} \cdot \frac{y}{y} = \frac{2y}{5y}$	19. Write a fractional expression equivalent to $\frac{3}{7}$ with a denominator of $7t$. A. $\frac{3}{7t}$ B. $\frac{3t}{7t}$ C. $\frac{7t}{7t}$ D. $\frac{t}{7t}$
To simplify a fractional expression, use the identity property of 1 to remove a factor of 1.	Simplify: $-\frac{24y}{15y}$ $-\frac{24y}{15y} = -\frac{8 \cdot 3y}{5 \cdot 3y}$ $= -\frac{8}{5} \cdot \frac{3y}{3y}$ $= -\frac{8}{5} \cdot 1$ $= -\frac{8}{5}$	20. Simplify: $\frac{27x}{36x}$ A. $\frac{3}{4}$ B. $\frac{3}{4x}$ C. $\frac{3x}{4}$ D. $\frac{3x}{4x}$

Objective [1.7b] Use the commutative and associative laws to find equivalent expressions.

Brief Procedure	Example	Practice Exercises
The Commutative Laws *Addition* For any numbers a and b, $a + b = b + a$. *Multiplication* For any numbers a and b, $ab = ba$. (We can change the order when adding or when multiplying without affecting the result.)	Use a commutative law to write an equivalent expression. a) $n + 6$ b) xy a) An equivalent expression is $6 + n$, by the commutative law of addition. b) An equivalent expression is yx, by the commutative law of multiplication.	21. Use a commutative law to write an equivalent expression for $8 + a$. A. $a + 8$ B. $8a$ C. $a8$ D. $8 - a$
The Associative Laws *Addition* For any numbers a, b, and c, $a + (b + c) = (a + b) + c$. *Multiplication* For any numbers a, b, and c, $a \cdot (b \cdot c) = (a \cdot b) \cdot c$. (Numbers can be grouped in any manner for addition and for multiplication.)	Use an associative law to write an equivalent expression. a) $(m + n) + 1$ b) $5(st)$ a) An equivalent expression is $m + (n + 1)$, by the associative law of addition. b) An equivalent expression is $(5s)t$, by the associative law of multiplication.	22. Use an associative law to write an equivalent expression for $(4x)y$. A. $y(4x)$ B. $(x4)y$ C. $4(xy)$ D. $y + (4x)$

Objective [1.7c] Use the distributive laws to multiply expressions like 8 and $x - y$.

Brief Procedure	Example	Practice Exercise
For any numbers a, b, and c, $a(b+c) = ab + ac$ and $a(b-c) = ab - ac$.	Multiply: $5(2x - 3y + z)$. $5(2x - 3y + z)$ $= 5 \cdot 2x - 5 \cdot 3y + 5 \cdot z$ $= 10x - 15y + 5z$	23. Multiply: $3(x + 4y - 2z)$. A. $3x + 4y - 2z$ B. $3x + 12y + 6z$ C. $3x + 12y - 6z$ D. $3x - 12y - 6z$

Objective [1.7d] Use the distributive laws to factor expressions like $4x - 12 + 24y$.

Brief Procedure	Example	Practice Exercise
Find the largest factor that is common to all the terms of the expression and factor it out.	Factor: $8a + 4b - 12c$. $8a + 4b - 12c$ $= 4 \cdot 2a + 4 \cdot b - 4 \cdot 3c$ $= 4(2a + b - 3c)$	24. Factor: $36m - 27n + 9p$. A. $3(12m - 9n + 3p)$ B. $36(m - 27n + 9p)$ C. $9(4m - 3n)$ D. $9(4m - 3n + p)$

Objective [1.7e] Collect like terms.

Brief Procedure	Example	Practice Exercise
Identify the terms with exactly the same variable, use the distributive laws to factor out the variable, and then simplify.	Collect like terms: $3x - 5y + 8x + y$. $3x - 5y + 8x + y$ $= 3x + 8x - 5y + y$ $= 3x + 8x - 5y + 1 \cdot y$ $= (3 + 8)x + (-5 + 1)y$ $= 11x - 4y$	25. Collect like terms: $6a - 4b - a + 2b$. A. $5a - 2b$ B. $2a + b$ C. $6a - 2b$ D. $5a + 6b$

Objective [1.8a] Find an equivalent expression for an opposite without parentheses where an expression has several terms.

Brief Procedure	Example	Practice Exercise
Change the sign of each term.	Find an equivalent expression without parentheses for $-(2x - 3y + 7z)$. We change the sign of each term. $-(2x - 3y + 7z) = -2x + 3y - 7z$	26. Find an equivalent expression without parentheses for $-(-3a + 6b - c)$. A. $3a + 6b - c$ B. $3a - 6b - c$ C. $3a - 6b + c$ D. $-3a - 6b - c$

Objective [1.8b] Simplify expressions by removing parentheses and collecting like terms.		
Brief Procedure	Example	Practice Exercise
Use a distributive law to remove parentheses and then collect like terms.	Remove parentheses and simplify: $6x - 2(x - 3y)$. $6x-2(x-3y) = 6x-2x+6y = 4x+6y$	27. Remove parentheses and simplify: $3m - n - (2m + 5n)$. A. $m + 4n$ B. $5m + 4n$ C. $m - 4n$ D. $m - 6n$

Objective [1.8c] Simplify expressions with parentheses inside parentheses.		
Brief Procedure	Example	Practice Exercise
Do the computations in the innermost grouping symbols first. Then work from the inside out.	Simplify: $3[5 - (8 - 4)]$. $3[5 - (8 - 4)] = 3[5 - 4]$ $= 3[1]$ $= 3$	28. Simplify: $[-16 \div (4 \cdot 2)]$. A. -2 B. -4 C. -6 D. -8

Objective [1.8d] Simplify expressions using rules for order of operations.		
Brief Procedure	Example	Practice Exercise
1. Do all calculations within parentheses before operations outside. 2. Evaluate all exponential expressions. 3. Do all multiplications and divisions in order from left to right. 4. Do all additions and subtractions in order from left to right.	Simplify: $10 - (6 - 4 \cdot 5)$. $10 - (6 - 4 \cdot 5) = 10 - (6 - 20)$ $= 10 - (-14)$ $= 10 + 14$ $= 24$	29. Simplify: $100 \div (-25) + 12 \div 3$. A. -8 B. -4 C. 0 D. 8